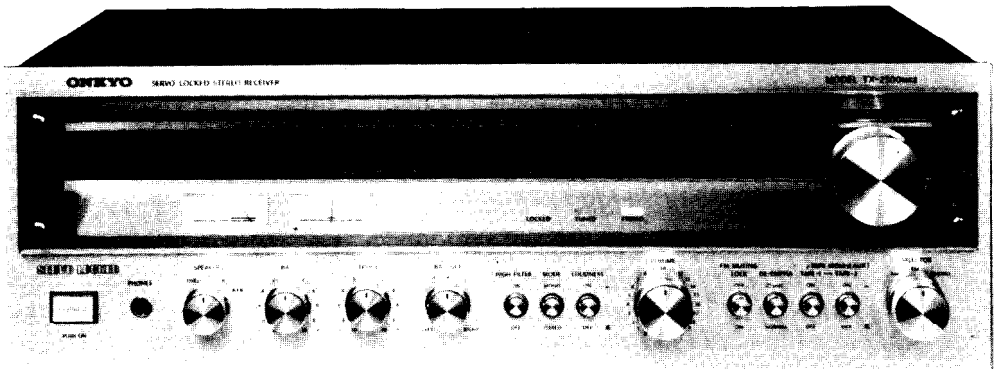
SERIAL NO. 3045

ONKYO SERVICE MANUAL

SERVO LOCKED
FM/AM STEREO RECEIVER
MODEL TX-2500MK II



ONKYO AUDIO COMPONENTS

SPECIFICATIONS

Amplifier section

Power Output	40 watts per channel, min. RMS, at 8 ohms both channels driven, from 20 Hz to 20 kHz, with no more than 0.1% total harmonic distortion.
Total Harmonic Distortion	0.1% at rated power 0.08% at 1 watt output
IM Distortion	0.3% at rated power 0.1% at 1 watt output
Damping Factor	40 at 8 ohms
Frequency Response	20 ~ 30,000 Hz (±1 dB)
Sensitivity and Impedance	PHONO: 2.5 mV 50 kohms TAPE PLAY: 150 mV 50 kohms TAPE REC: 150 mV 3.5 kohms (PHONO)
Phono Overload	150 mV RMS at 1 kHz 0.1% THD.
Treble Control	±10 dB at 10 kHz
Bass Control	±12 dB at 100 Hz
Signal to Noise Ratio	PHONO: 85 dB (at 10 mV input IHF A network) 65 dB (IHF C network) TAPE: 95 dB (IHF A network) 90 dB (IHF C network)
High Filter	6 kHz 6 dB/oct.
Loudness (−30 dB)	+9 dB at 40 Hz +5 dB at 20 kHz

Tuner section

Tuning Range	FM:	88 ~ 108 MHz
	AM:	530 ~ 1605 kHz
Usable Sensitivity	FM mono:	11.2 dBf, 2 μV
	FM stereo:	19.2 dBf, 5 μV
	AM:	25 μV
50 dB Quieting Sensitivity	FM mono:	17.2 dBf, 4 μV
	FM stereo:	37.2 dBf, 40 μV
Intermediate frequency	FM:	10.7 MHz
	AM:	455 kHz
Capture Ratio	FM:	2 dB
Image Rejection Ratio	FM:	45 dB
	AM:	45 dB
IF Rejection Ratio	FM:	80 dB
	AM:	30 dB
Spurious Rejection	FM: 1/2 IF	80 dB
Signal to Noise Ratio	FM mono:	65 dB
	FM stereo:	60 dB
	AM:	40 dB
ACA	FM:	60 dB
AM Suppression Ratio	FM:	50 dB
Harmonic Distortion	FM mono:	0.2%
	FM stereo:	0.4%
	AM:	0.8%
Frequency Response	FM:	30 ~ 15,000 Hz +0.5, − 2 dB
Stereo Separation	FM:	37 dB at 1 kHz 30 dB at 100 ~ 10,000 Hz
Muting Level	FM:	14.7 dBf, 3 μV
Stereo Threshold	FM:	14.7 dBf, 3 μV
Locked Level	FM:	14.7 dBf, 3 μV
Tuning Meter	Signal strength & Center tuning	

General

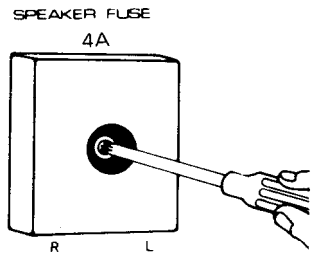
Power Supply	AC 120 volts 60 Hz 130 watts
Dimensions	19"W x 6-5/16"H x 14-5/8"D 483mmW x 160mmH x 371mmD
Weight	25.3 lbs. 11.5 kg.
Semiconductors	1 FET, 30 Transistors, 8 ICs, 28 Diodes

Specifications are subject to change without notice for improvement.

SERVICE NOTES

1. REPLACEMENT OF THE AC FUSE

1) Remove four screws holding leg and bottom board.
2) Remove five screws holding bottom board and side bracket.
3) Replace the AC fuse on the power supply p.c.b.



2. REPLACEMENT OF THE SPEAKER PROTECTION FUSE

1) Remove a screw holding the cover and back panel and remove the cover.
2) Replace the fuse with indical 4-ampere types.

3. When replacing differential amplifier or push-pull amplifier transistors, be sure that transistors of one channel have the same h_{FE} ratings.

4. If the TUNED lamp does not turn off when you touch the tuning knob, this may be due to strong signals generated by a nearby MW or SW broadcasting station. In this case, adjust the frequency of oscillator coil with L201 until the TUNED lamp turn off.

5. REMOVEMENT OF THE FRONT PANEL

1) Remove four screws holding top cover and chassis.
2) Remove two screws holding top cover and back panel.
3) Remove five screws holding front panel and front bracket.
4) Pull out all control knobs.

6. REMOVEMENT OF THE DIAL GLASS

1) Remove four screws holding dial glass and front panel.

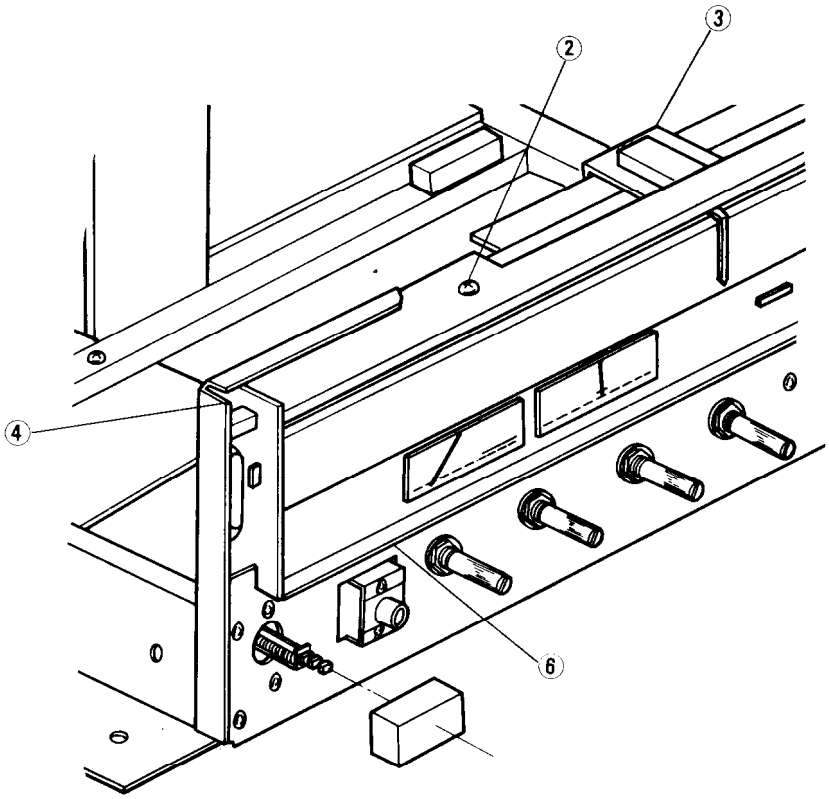
NOTES: The dial glass has been mounted by applying an 800gr torque to the screws. If the dial glass is removed during repairs, and a torque driver is available, apply 800gr torque to the screws when replacing. If, however, a torque driver is not available, simply tighten the screws by hand.
When replacing the dial glass, insert all relevant component parts in accordance with the cross-sectional diagram.

7. REPLACEMENT OF INDICATOR LAMPS

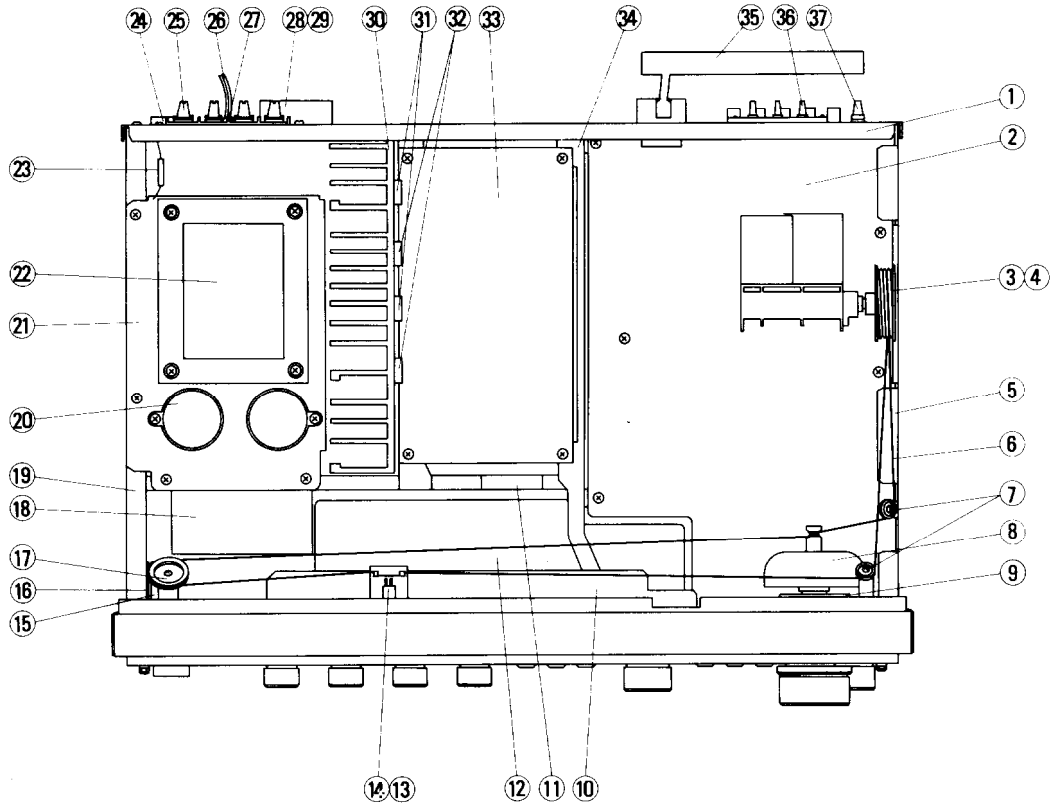
All indicator lamps are linked to their respective lamp covers. So when replacing, remove the defective lamp from the front bracket with its cover in place.

8. REPLACING THE METER

1) Remove the top cover and the front panel.
2) Remove the two screws securing the illumination bracket and front bracket.
3) Remove the pointer ass'y from the front bracket.
4) Remove the 2 sets of screws securing the left and right lamp covers and dial plate covers to the front bracket.
5) Move the front panel out, keeping the dial plate cover held against the dial plate, and remove the 2 (left and right) lamp PC boards. Then remove the dial plate from the drive shaft.
6) Remove the 3 screws securing the front cover to the back plate.
7) The top sides of the meter covers are fastened to the back plate by adhesive tape. Remove this tape, taking care not to jar or knock the meters.



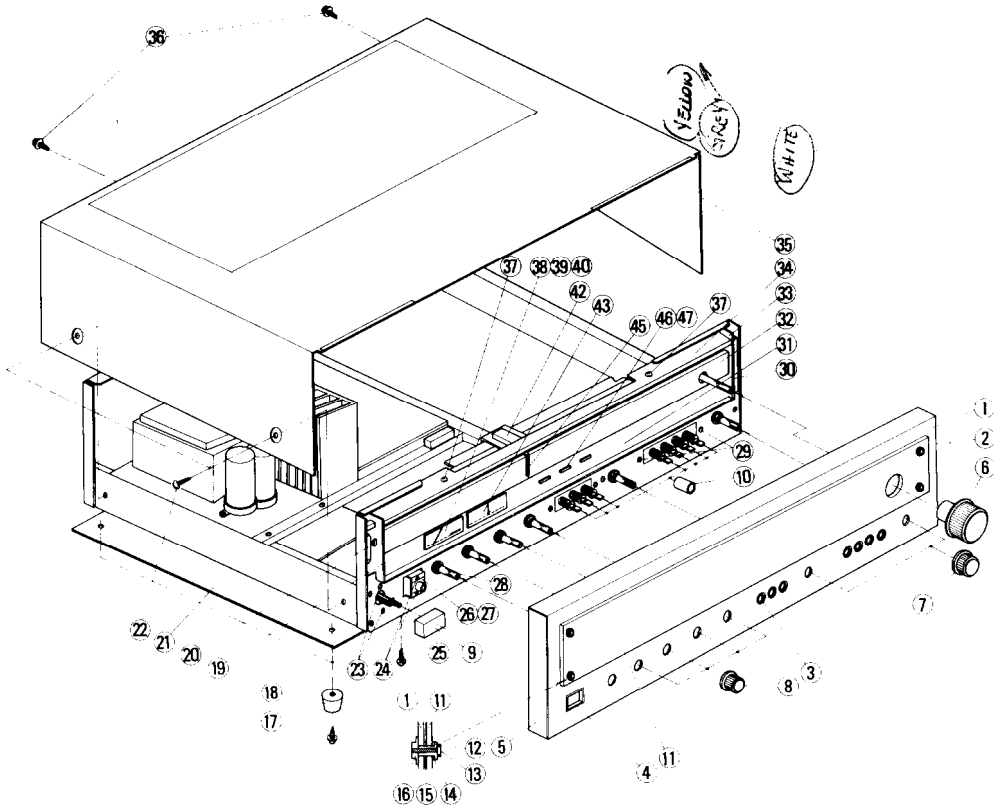
COMPONENT LOCATION



COMPONENT LOCATION-PARTS LIST

REF. NO.	CIRCUIT NO.	PARTS NO.	DESCRIPTION
1	A081	27120114	Back panel
2		13719570	NARFE-470, AM/FM tuner and equalizer ampli. p.c.b.
3	A075	27200019	Dial drum
4	A077	273803	SP-14A, Spring for dial drum
5	A035	27115030	Side bracket
6	A078	273903	200mm, Dial cord
7	A005	27185002	DP-16N, Dial pulley
8	A002	27205013	Drive shaft
9	A003	27300071	Bearing
10	A001	27110056	Front bracket
11		250130	T-4461, Terminal
12		13719571	NAAF-471, Preampli. p.c.b.
13	PL808	210044	PL8V0.05AW-3, Pointer lamp
14	A012	27220009	Pointer slider ass'y
15	S901	25035047	NPS-111L12P, Power switch
16	C951	3504012	0.01μF, 125V, UL capacitor
17	A004	27185001	DP-26N, Dial pulley
18		13719573	NAPS-473, Rectifier p.c.b.
19	A042	27115031	Side bracket
20	C908, C909	3504107	8,200μF, 50V, Elect. capacitor
21	A060	27130125	Bracket, transformer
22		230236	NPT-639D, Power transformer
23	R801	431523355	3.3MΩ, 1/2W, Solid resistor
24	P901, P902	25050008A	S-I6432, AC outlet
25	P805, P806	25060026	NTM-4PRMN03, Speaker terminal
26	W901	253072	AS-UC, Power supply cord
27	W901a	270025	SR-3P-4, Strainrelief
28	F501, F601	252014	4A-T, Speaker protector fuse
29	F501a, F601a	25050004	Fuseholder with cover
30	A070	27160035	Radiator
31	Q505, Q605	2200822	2SD718 (R) Power ampli.
		2200823 or	2SD718 (O) or transistor
32	Q506, Q606	2200832	2SB688 (R) Power ampli.
		2200833 or	2SB688 (O) or transistor
33		13719572	NADA-472, Power ampli. p.c.b.
34	A046	27130126A	Bracket S
35		232066	NMA-3012, AM bar antenna
36	P804	25060020	NTM-3WPUN1, Antenna terminal
37	P803	25060008	Ground terminal

EXPLODED VIEW



EXPLODED VIEW-PARTS LIST

REF. NO.	CIRCUIT NO.	PARTS NO.	DESCRIPTION
		13719121-1	Front panel ass'y (1–5)
1	A501	27210095	Front panel
2	A502	28125048	End cap R
3	A509	27267026	Guide, push switch
4	A508	27267027	Guide, power switch
5	A503	28125049	End cap L
6	A801	28320242	Tuning knob
7	A802	28320238	Volume knob
8	A803	28320237	Tone knob
9	A804	28320235	Power knob
10	A805	28320239	Push knob
11	A504	28191024	Dial glass
12	A505	27270014	Spacer
13	A506	27300038A	Screw
14	A512	870052	Washer
15	A511	870051	Washer
16	A507	86213010	WN3x10FN, Nut
17	A605	831130162	3STW+16BQ, Screw
18	A604	280379	Leg
19	A015	27300102	Dial plate cover
20		13719574	NAPL-474, Dial illumination p.c.b.
21	A600	27170041	Bottom board
22	A352	838440109	4TTB+10C (BC), Screw
23	A028	834130062	3STS+6BQ, Screw
24	A023	801105	8W3P+6FN, Screw
25	A602	831130082	3STW+8BQ, Screw
26	P807	25045018	LJ-100H, Stereo headphone jack
27	R528, R628	441623314	330Ω, 1W, Metal oxide film resistor
28	S810	25030098	NRS-144-30Y, Speaker selector switch
29		82113006	3P+6F-N, Screw
30		27300113	Lamp cover
31	A010	28133007	Back plate
32	A013	28130063	Dial plate
33	A016	27300103	Dial plate cover
34	A011	27240015	Illumination bracket
35	A351	28184037	Top cover
36	A353	834430102	3STS+10BQ(BC), Tapping screw
37		834430102	3STS+6BQ Screw
38	M102	243085	NIND-0500S85, Strength meter
39	PL803, PL804	210041	PL8V0.15AW-2, Meter illumination lamp
40	A007	27300114	Cushion
42	A022	28168002	Pointer cover
43	M101	243084	NIND-0250S84, Center meter
45	A009	28165042	Pointer
46	A017	28198512	Facet
47	PL805-PL807	210040	PL12V 30mV, Stereo/Locked/ Tuned indicator lamp

ALIGNMENT PROCEDURES

INSTRUMENTS REQUIRED

1. DC Voltmeter
2. AM Sweep Generator
3. AM/FM Signal Generator
4. AC VTVM
5. Oscilloscope
6. Monitorscope
7. Distortion Analyzer
8. Stereo Modulator
9. Frequency Counter

GENERAL ALIGNMENT CONDITIONS

1. Signal input should be kept as low as possible.
2. Standard modulation is 400Hz 30% (AM), 1kHz 100% (FM MONO), pilot 9% sub and main 91% (FM STEREO).
3. Standard knob position

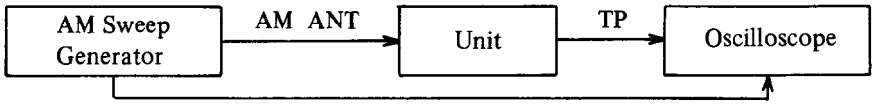
SPEAKERS . . . . . A
BASS, TREBLE & BALANCE . . . . . Center
HIGH FILTER . . . . . OFF
MODE . . . . . STEREO
DE-EMPHA . . . . . NORMAL
LOUDNESS . . . . . OFF
MUTING LOCK . . . . . OFF
TAPE 1, 2 . . . . . OFF (SOURCE)

(1) IDLING CURRENT ADJUSTMENT

Connect the DC Voltmeter between ID and CT terminals.
Adjust the voltage to 20±5mV with ~~R513~~ (Left channel) R515
Adjust the voltage to 20±5mV with ~~R613~~ (Right channel) R615
NOTES: Adjust after switching on for 10 minutes.
Open load VOLUME . . . . . Minimum TAPE MONITOR–1 . . . . . ON

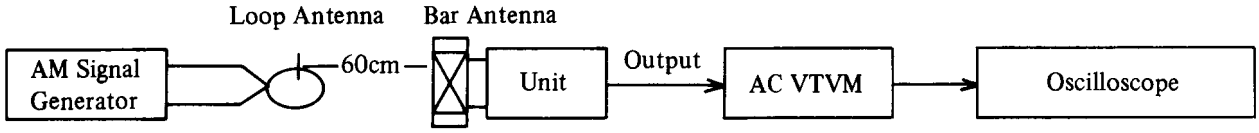
(2) AM IF ALIGNMENT

1. Set SELECTOR switch to AM.
2. Set radio dial to quiet point.



Set signal	Adjust	Oscilloscope	Remarks
455kHz	X103	Maximum Symmetrical Response	Usually not necessary to adjust

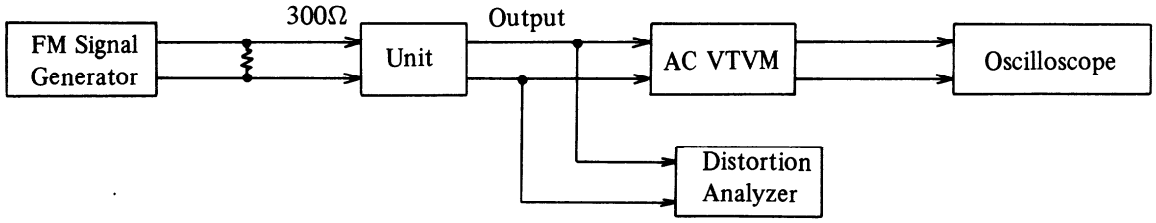
(3) AM RF ALIGNMENT



Step	Set Signal	Set Radio Dial	Adjust	VTVM reading	Remarks
1	515kHz 400Hz 30%	Lower end (515kHz)	L103	Maximum	Repeat step 1 and 2 as necessary
2	1680kHz 400Hz 30%	Upper end (1680kHz)	TC002	Maximum	
3	600kHz 400Hz 30%	600kHz	L007	Maximum	Repeat step 3 and 4 as necessary
4	1400kHz 400Hz 30%	1400kHz	TC001	Maximum	

(4) FM FRONT END ALIGNMENT

1. Set SELECTOR switch to FM.
2. Connect FM Signal Generator to 300–ohm antenna terminals.

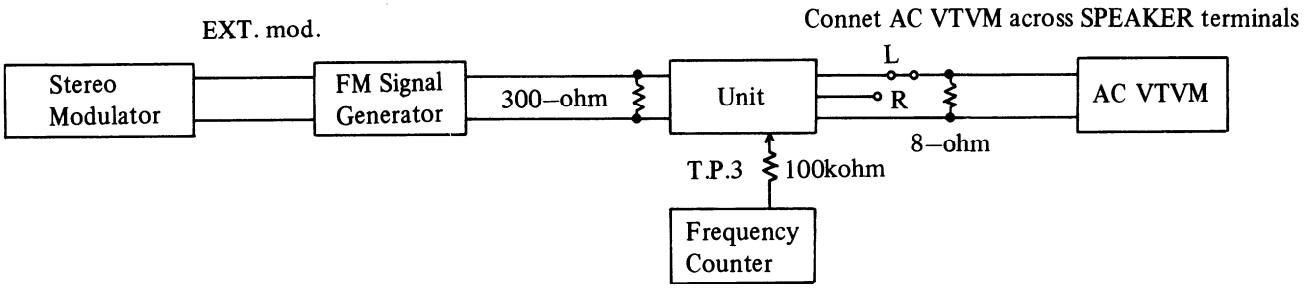


Step	FM Signal Generator	Dial to set	Adjust	Output Indicator	Adjust for	Remarks
1	No signal	Quiet Point	T101 Bottom	Tuning Indicator	Center	Repeat Steps 1 and 2 as necessary
2	98MHz 65dBf 1kHz 75kHz div.	98MHz	T101 Top	Distortion Analyzer	Minimum	
3	90MHz 65dBf 1kHz 75kHz div.	90MHz	L004	Tuning Indicator	Center	Repeat Steps 3 and 4 as necessary
4	106MHz 65dBf 1kHz 75kHz div.	106MHz	TC005		Center	
5	90MHz 20dBf 1kHz 75kHz div.	90MHz	L001 L002	AC VTVM or Oscilloscope	Maximum	Repeat Steps 5 and 6 as necessary
6	106MHz 20dBf 1kHz 75kHz div.	106MHz	TC003 TC004		Maximum	
7	98MHz 65dBf 1kHz 75kHz div.	98MHz	T001	Distortion Analyzer	Minimum	

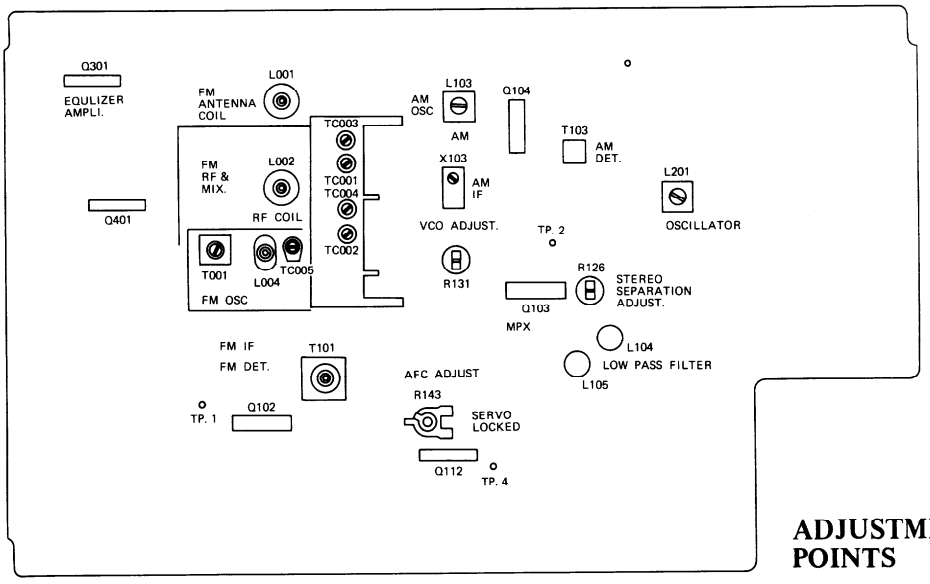
(5) SERVO LOCKED CIRCUIT ALIGNMENT

FM signal generator	Dial to set	FM muting switch	Adjust	Output Indicator	Adjust for
98MHz 65dBf 1kHz 75kHz div.	98MHz	Off	Tuning	Center Meter	Center
		On	R143		Center

(6) MULTIPLEX ALIGNMENT



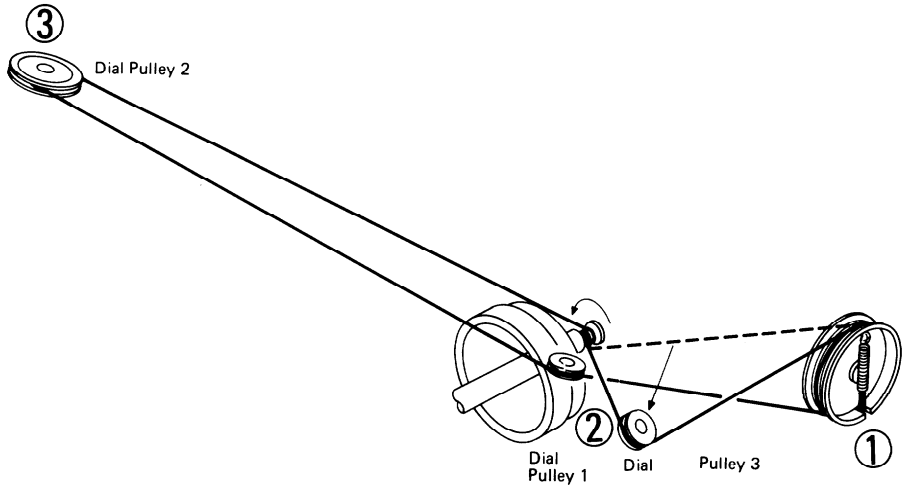
Step	FM Signal Generator	Stereo Modulator	Dial to set	Adjust	Output Indicator	Adjust for	Remarks
1	98MHz no mod. 65dBf	–	98MHz	R131	Frequency Counter	19,000±19Hz	
2	STEREO INDICATOR should light up when stereo program is being received.						
3	98MHz EXT. Mod. 65dBf	Pilot Sig. 9% Main & Sub Sig. 1KHz Lch 91%	98MHz	R126	AC VTVM Right ch.	Minimum	Repeat Steps 3 & 4 as necessary
4	Same as above	Pilot Sig. 9% Main & Sub Sig. 1KHz Rch 91%	98MHz	R126	AC VTVM Left ch.	Minimum	



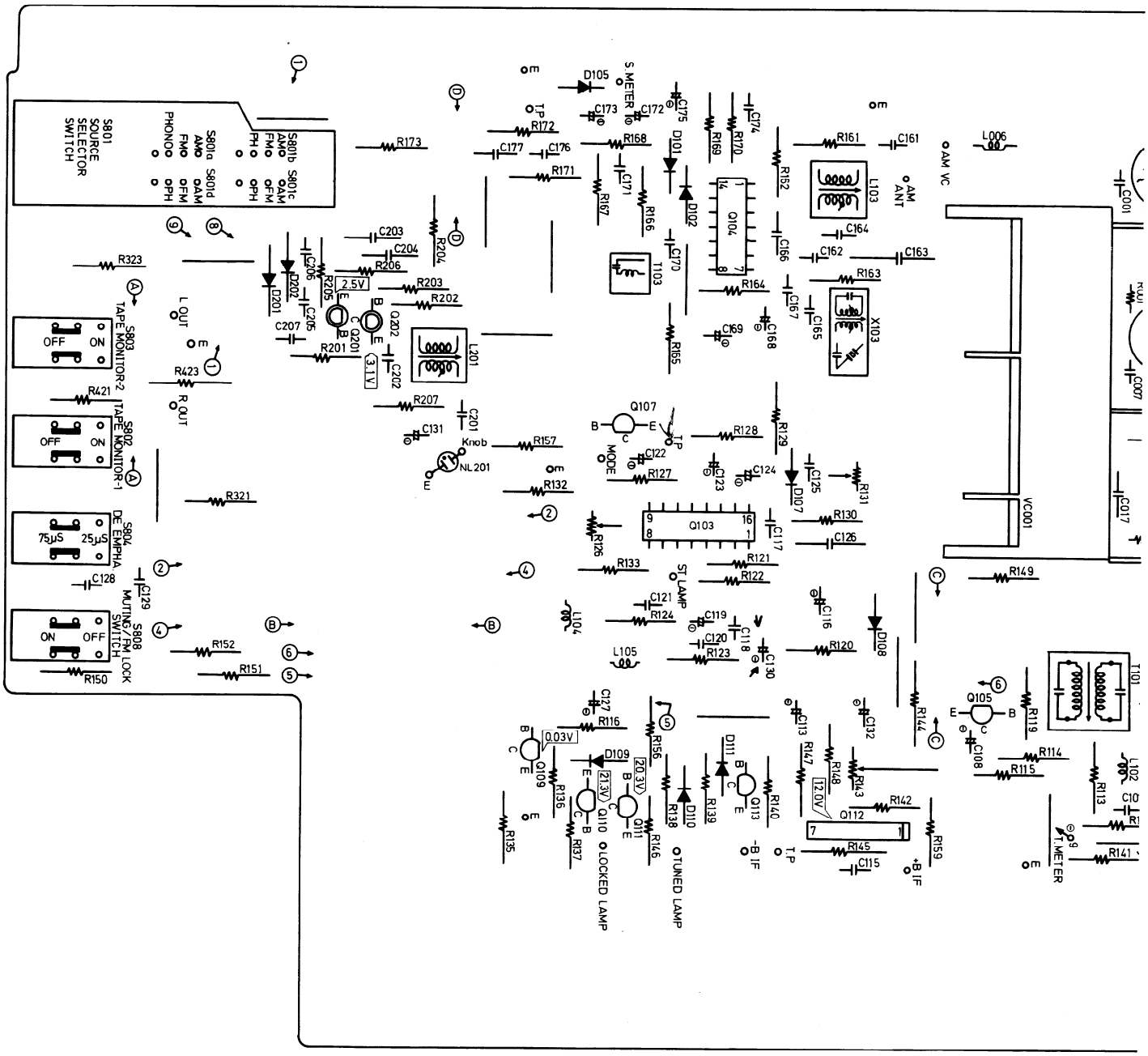
ADJUSTMENT POINTS

STRINGING DIAGRAM

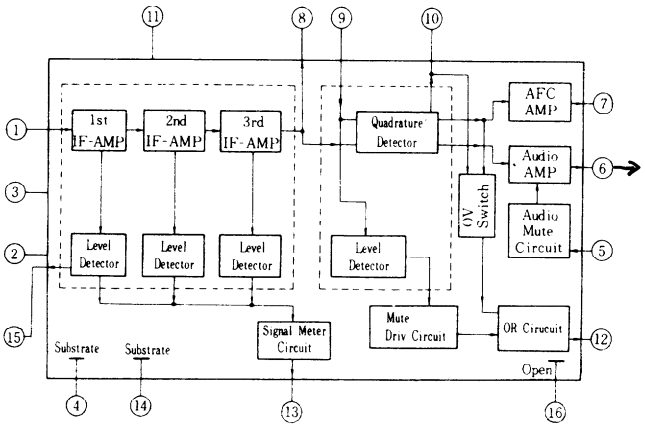
1. Close the variable capacitor complete and tie the dial cord to the spring of the drum.
2. Thread the dial cord in the direction of arrow from (1) to (3) and wind the dial cord three turns around the tuning shaft clockwise.
3. Wind the dial cord 1½ turns around the dial drum.
4. Thread the dial cord to the dial pulley 3.



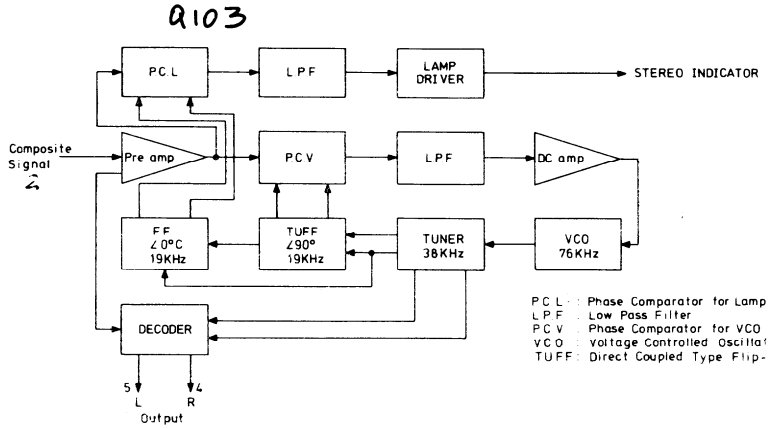
AM/FM TUNER AND EQUALIZER AMP. PC BOARD VIEW FROM BOTTOM SIDE



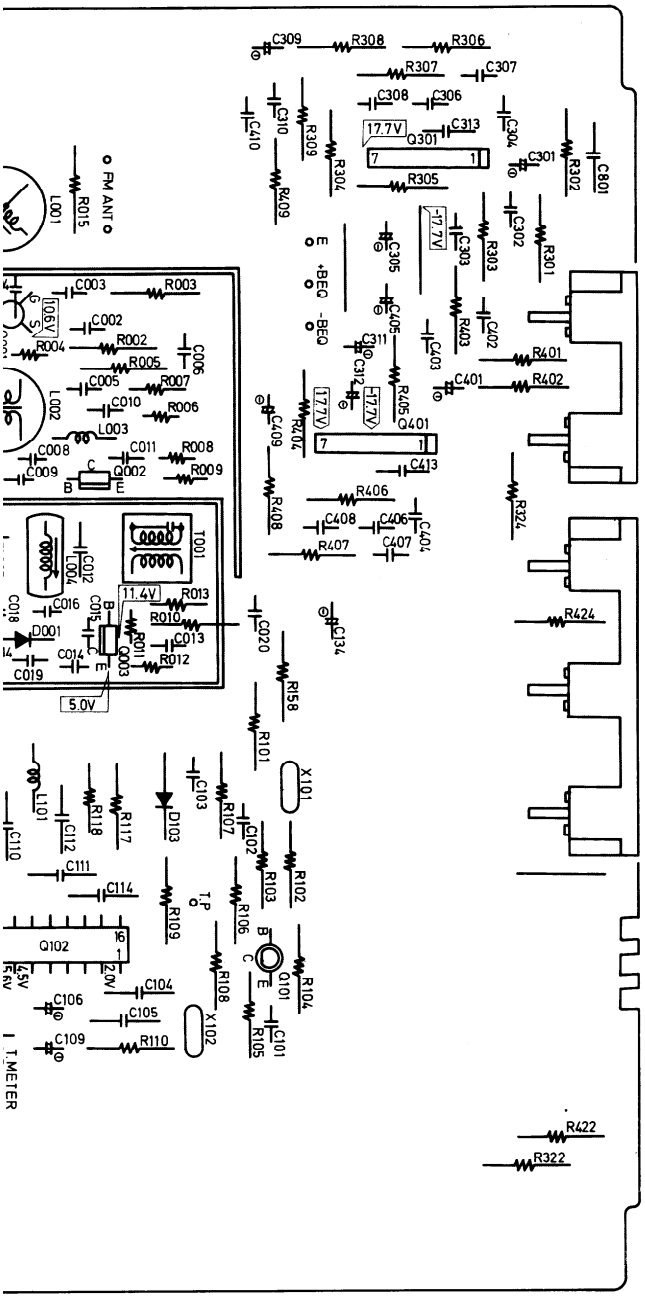
HA-1137 BLOCK DIAGRAM

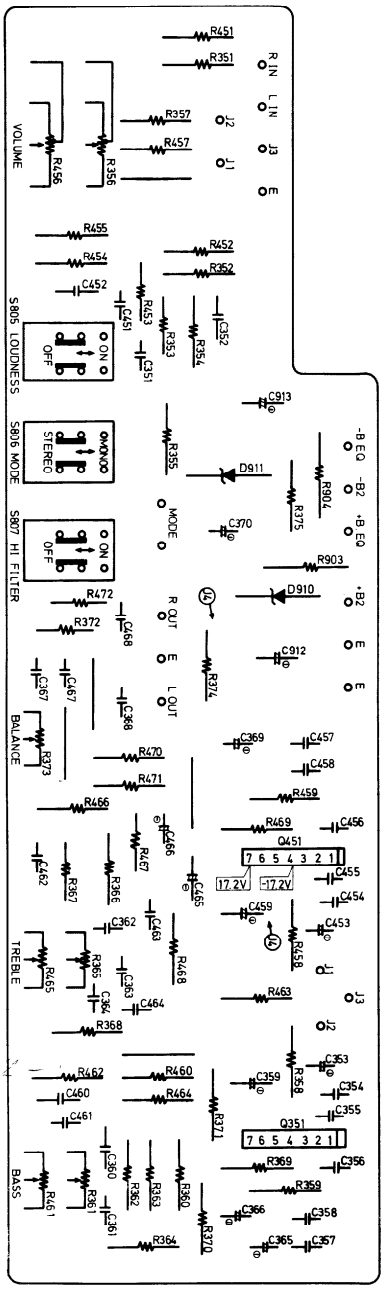


BA-1320 BLOCK DIAGRAM

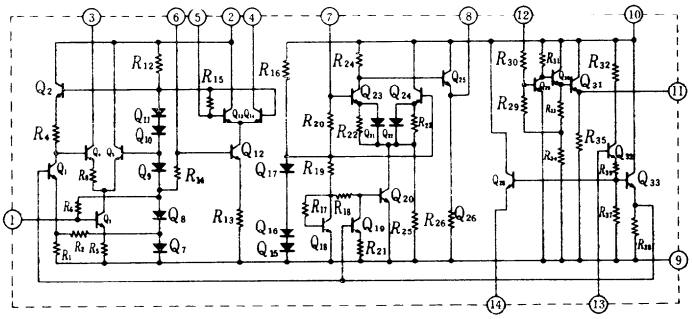


PREAMP. PC BOARD VIEW FROM BOTTOM SIDE



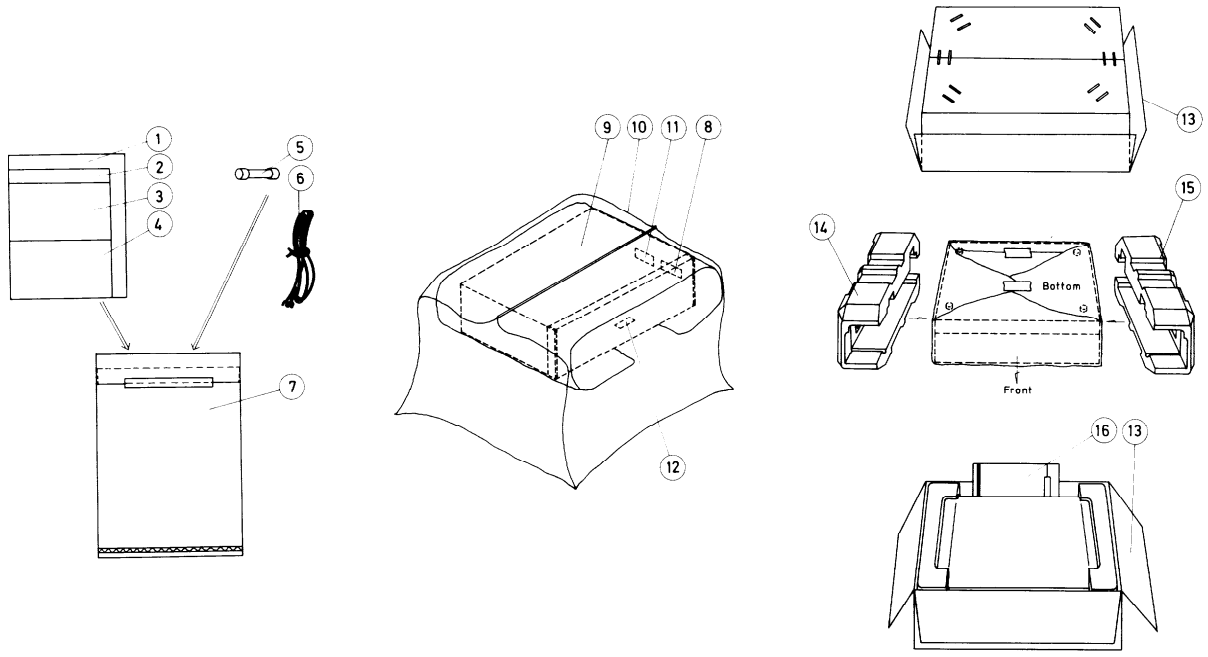


HA-1151 EQUIVALENT CIRCUIT



VOLTAGE
MEASURED WITH
V.T.V.M
(NO INPUT SIGNAL)

PACKING PROCEDURES



PARTS LIST

REF. NO.	CIRCUIT NO.	PARTS NO.	DESCRIPTION
1	A881	29340257	Instruction manual
2	A889	29358001	Service station list
3	A885	29355046	Caution card, warranty
4	A882	29365003	Warranty card
5	A902	252014	4A-T, Fuse
6	A901	292064	5059-01, FM antenna
7	A861	29100006	Poly bag
8	A886	29360197	Label, cabinet composite
9	A855	290093	500x1,200, Protection sheet
10	A854	29100027A	850 x 650mm, Poly bag
11	A884	282969	Caution label
12	A883	293041	Caution card
13	A851	29050185	Carton box
14	A852	29090279	Pad R
15	A853	29090278	Pad L
16		13719119	Accessary bag

ONKYO CORPORATION

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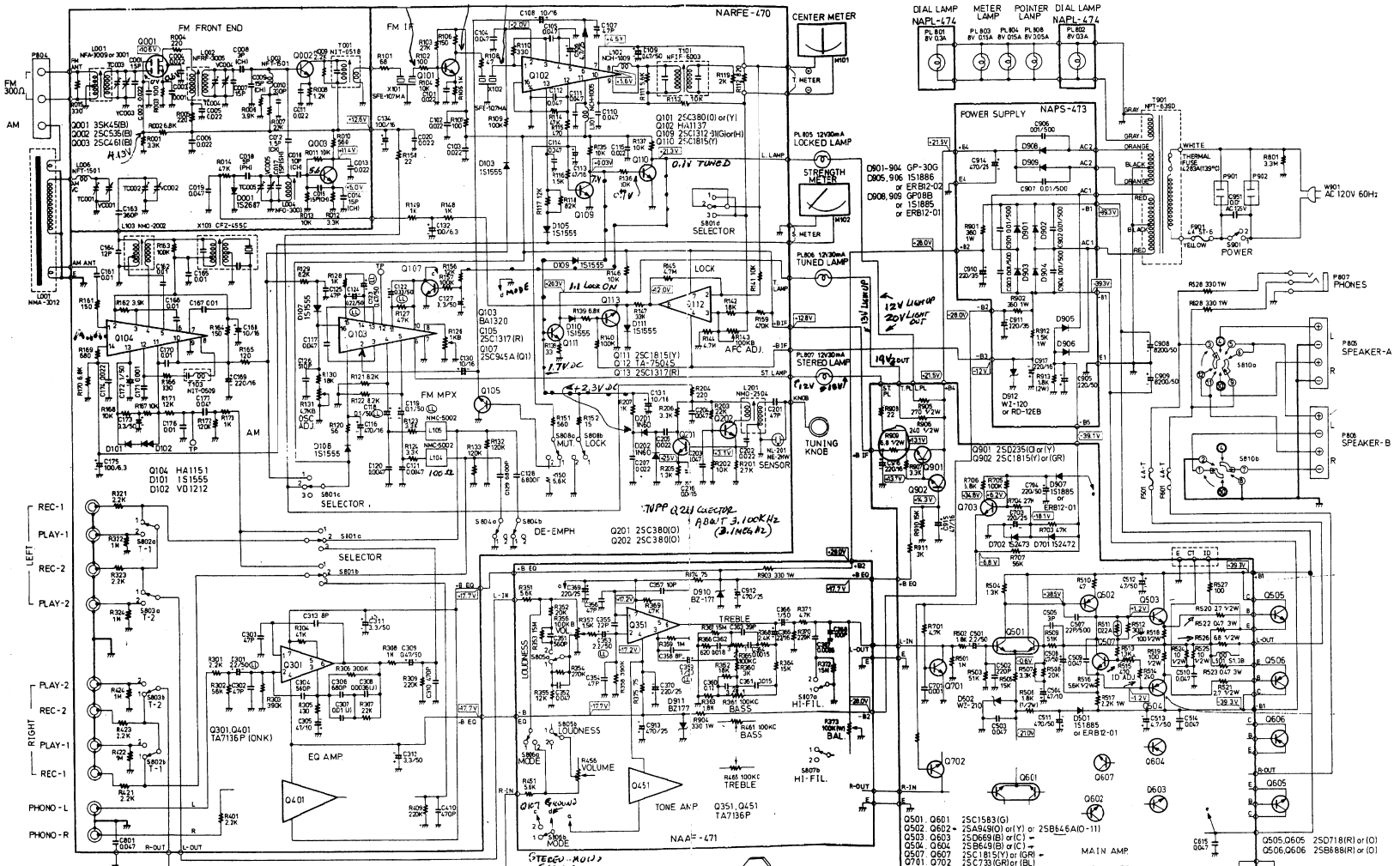

NARFE-470
FM FRONT END
FM IF
CENTER METER
DIAL LAMP NAPL-474
METER LAMP
POINTER LAMP
DIAL LAMP NAPL-474
POWER SUPPLY NAPS-473
FM 300Ω
AM
AM ANT
LOCKED LAMP
STRENGTH METER
TUNED LAMP
STEREO LAMP
SELECTOR
TUNING KNOB
POWER
AC 120V 60Hz
PHONES
SPEAKER-A
SPEAKER-B
REC-1
PLAY-1
REC-2
PLAY-2
PHONO-L
PHONO-R
LEFT
RIGHT
EQ AMP.
TONE AMP.
MAIN AMP.
NAA-471
NADA-472
DE-EMPH
LOUDNESS
VOLUME
TREBLE
BASS
HI-FIL.
BAL.
MUTING
LOCK
SENSOR
AFC ADJ.
FM MPX
STEREO MONO SWITCH
TUNE GROUND OUT
Q001 35K45(B)
Q002 2SC535(B) or 2SC461(B)
Q003 2SC461(B)
Q101 2SC380(O) or (Y)
Q102 HA1137
Q109 2SC1312-3(G)or(H)
Q110 2SC1815(Y)
Q103 BA1320
Q105 2SC1317(R)
Q107 2SC945A(Q1)
Q111 2SC1815(Y)
Q112 TA-7504S
Q113 2SC1317(R)
Q104 HA1151
D101 1S1555
D102 V01212
Q201 2SC380(O)
Q202 2SC380(O)
Q301,Q401 TA7136P(ONK)
Q351,Q451 TA7136P
Q901 2SD235(O) or (Y)
Q902 2SC1815(Y) or (GR)
Q501,Q601 2SC1583(G)
Q502,Q602 2SA949(O) or (Y) or 2SB646A(O-11)
Q503,Q603 2SD669(B) or (C)
Q504,Q604 2SB649(B) or (C)
Q507,Q607 2SC1815(Y) or (GR)
Q701,Q702 2SC733(GR) or (BL)
Q703 2SC1681(O-1) or (O-2)
D901-904 GP-30G
D905,906 1S1886 or ERB12-02
D908,909 GP08B or 1S1885 or ERB12-01
S901 POWER 1-ON 2-OFF
S801a-d SELECTOR 1-AM 2-FM 3-PH
S802a,b T.MONI-1 1-OFF 2-ON
S803a,b T.MONI-2 1-OFF 2-ON
S804a,b DE-EMPH 1-NORM 2-25μS
S805a,b LOUDNESS 1-OFF 2-ON
S806a,b MODE 1-STEREO 2-MONO
S807a,b HI-FILTER 1-OFF 2-ON
S808a MUTING 1-ON 2-OFF
S808b LOCK 1-ON 2-OFF
S810a,b SPEAKER 1-OFF 2-A 3-B 4-A+B
(BOTTOM VIEW) 3SK45
2SC535 2SC461
2SC380 2SC733 2SC1681
2SC1312
2SC1317 2SC1815
2SA949 2SB646
2SC1235
2SD718 2SA688
2SD669 2SB649
2SC1583
TA7136P TA7504S
(TOP VIEW) HA1137 HA1151 BA1320
NOTES
•ALL RESISTORS ARE IN OHMS, ¼WATT UNLESS OTHERWISE NOTED.
•ALL CAPACITORS ARE IN μF, 50WV UNLESS OTHERWISE NOTED.
•ELECTROLYTIC CAPACITORS (—⊞—) ARE IN μF/WV.
•VOLTAGE (MEASURED WITH V.T.V.M)(NO INPUT SIGNAL).
•CIRCUIT IS SUBJECT TO CHANGE FOR INPROVEMENT.
ONKYO® CORPOR.

PARTS LIST

Q701, Q702	2210085 or 2210086	2SC733 (GR) or T.K.C 2SC733 (BL)
Q703	2210670 or 2210671	2SC1681 (O-1) or T.K.C 2SC1681 (O-2)
Q901	2200013 or 2200014	2SD235 (O) or Rectifier 2SD235 (Y)
Q902	2211254 or 2211255	2SC1815 (Y) or Rectifier 2SC1815 (GR)
	DIODES	
D501, D907	223802 or 223849	1S1885 or ERB12-01
D502	223921	WZ-210, Zener
D701	223123	1S2472
D702	223124	1S2473
	CAPACITORS	
C501, C601	352780221	2.2μF, 50V, Elect.
C504, C604	352734701	47μF, 10V, Elect.
C508, C608	352784701	47μF, 50V, Elect.
C511, C611	352784711	470μF, 50V, Elect.
C512, C513 C612, C613	352780471	4.7μF, 50V, Elect.
C703	352752211	220μF, 25V, Elect.
C704	352782211	220μF, 50V, Elect.
C915	352744701	47μF, 16V, Elect.
C916	352742211	220μF, 16V, Elect.
	RESISTORS	
R511, R611	4000003	D22A, Themistor
R515, R615	5225026 ,	N10HR470BD, Idling current adjustment
R517, R617	441622224	2.2kΩ, 1W, Metal oxide film
R522, R523 R622, R623	48394794	0.47Ω, 3W, Cement
	RADIATOR	
	27160029	RAD-07, Radiator
	COILS	
L501, L601	231001	S-1.3B

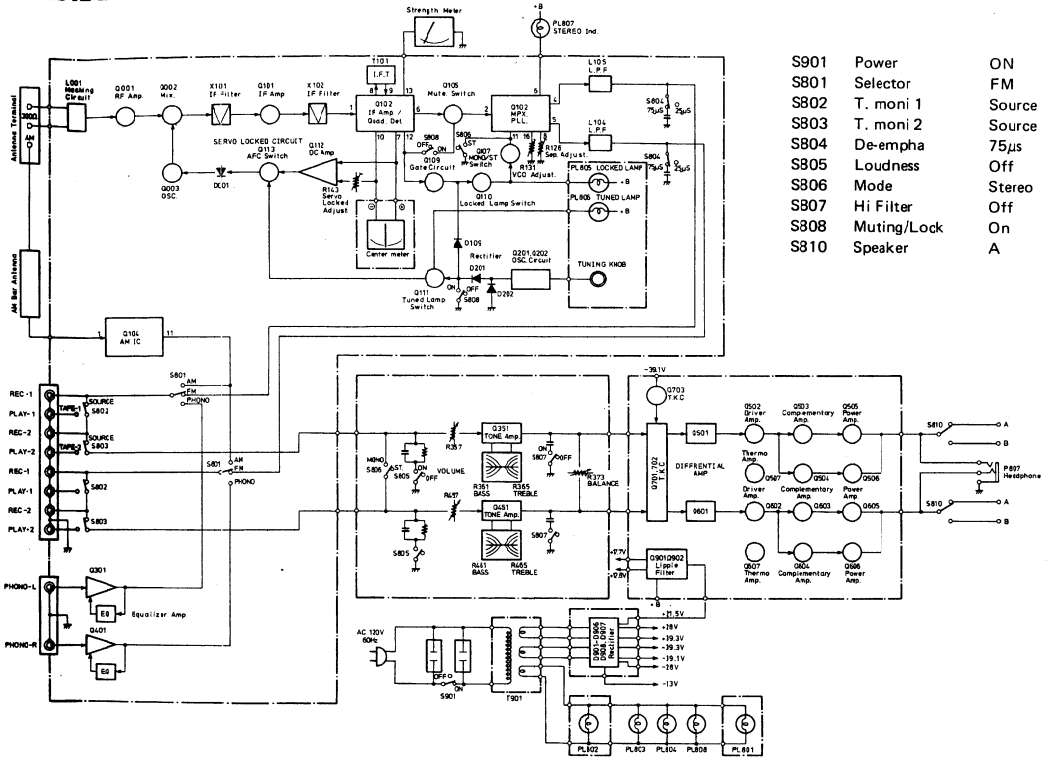
RECTIFIER PC BOARD (NAPS-473) – PARTS LIST

CIRCUIT NO.	PARTS NO.	DESCRIPTION
	DIODES	
D901~D904	223841	GP-30G
D905, D906	223806 or 223850	1S1886 or ERB12-02
D908, D909	223848, 223802 or 223849	GP08P, 1S1885 or ERB12-01
D912	223910 or 223963	WZ-120 or RD-12EB
	CAPACITORS	
C905	352782211	220μF, 50V, Elect.
C910, C911	352762211	220μF, 35V, Elect.
C914	352754711	470μF, 25V, Elect.
C917	352742211	220μF, 16V, Elect.
	METAL OXIDE FILM RESISTORS	
R901, R902	441623614	360Ω, 1W
R912	441621524	1.5KΩ, 1W
R913	441721824	1.8KΩ, 2W
	FUSE HOLDER	
	250113	S-N5051
	FUSE	
F901	252049	4A ST-6, AC

DIAL ILLUMINATION PC BOARD (NAPL-474) – PARTS LIST

P801	210039A	300mA, 8V, Dial illumination lamp

BLOCK DIAGRAM



S901	Power	ON
S801	Selector	FM
S802	T. moni 1	Source
S803	T. moni 2	Source
S804	De-empha	75μs
S805	Loudness	Off
S806	Mode	Stereo
S807	Hi Filter	Off
S808	Muting/Lock	On
S810	Speaker	A

NOTES:

CAPACITOR

LL: Low leakage current type electrolytic capacitor

ST: Polystren film capacitor

When replacing differential amplifier or push-pull amplifier transistors, be sure that transistors of one channel have same h_{FE} ratings.

CIRCUIT DESCRIPTION

1. Muting Circuit

The Quadrature detector IC incorporates an IF level detector circuit (output at pin 12). If the IF signal level drops below the muting level, pin 12 will be switched to high level, turning Q105 on. Consequently, the detector output signal will be cut off before it can be applied to the multiplex IC. When, on the other hand, the IF signal level is higher than the muting level, the Q102 pin 12 will be switched to low level, turning Q105, and Q109 off. Q110 will therefore turn on, followed by the LOCKED lamp turning on.

2. Servo Locked Circuit

The DC potential difference across both ends of the tuning meter (corresponding to the DC portion of the ratio detector output) is amplified by about 30dB by the Q112 operational amplifier in order to increase the AFC control capacity.

3. AFC Switching Circuit

In order to ensure accurate tuning, the AFC circuit is automatically disconnected as soon as the tuning knob is touched. The Q202 oscillator circuit generates a signal of approximately 6MHz which is amplified by Q201, and full-wave rectified by D201/D202. The DC portion of this signal is then employed in switching Q113 on and off. When tuned away from broadcasting stations, the Q109 collector will be at low level, thereby switching the Q111 base voltage to low level also. Q113 will consequently turn on, and the AFC circuit turn off. When tuned into a station, however, the Q111 base voltage will be switched to high level, thereby turning Q111, and the Tuned Lamp on. Q113 will turn off, and the AFC circuit turn on. If the tuning knob is then touched, the oscillator circuit will cease to generate signals, and the AFC circuit will turn off. Furthermore, the NL-201 neon lamp serves to prevent the destruction of transistors due to the presence of static electricity.